

Glacier National Park Repeat Photo Education Trunk

A Glacier Photography Exhibit along with
Precipitation Measurement Lessons



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7. Student Worksheets for making observations of Repeat Photo Exhibit and assignment for discovering changes in your hometown by looking at repeat photos. (Created by Catherine Hade, Waynesboro Area Middle School.)
8. [How Much Water is in this Snow?](http://www.nps.gov/glac/learn/education/loader.cfm?csModule=security/getfile&PageID=425469) (Glacier NP lesson also at <http://www.nps.gov/glac/learn/education/loader.cfm?csModule=security/getfile&PageID=425469>) .
9. "Measuring Precipitation" (GPM Activity #8- on flash drive, see below) or <http://pmm.nasa.gov/education/lesson-plans/measuring-precipitation> .
10. "Fun with Rainfall Measurements" activity, <http://www.cocorahs.org/Media/docs/LessonPlans/4h/4h-rainfall-measurements.pdf> .

Climate Change Resource Guide (on flash drive and also at <http://www.gnpclimatechangeinfo.org>)

- **Park Information** Fact sheets about the park
- **Climate Change Trunk** Facing the Future Climate Change Curriculum
- **Repeat Photography** Additional repeat photos of glaciers
- **Service Learning** Examples from in the field
- **Resources** Includes podcasts and resource briefs about climate change
- **Web Links** Web links to useful climate change resources on the internet.

Global Precipitation Measurement Mission (GPM), NASA (on flash drive and also at <http://pmm.nasa.gov/education/lesson-plans/survivor-earth>)

- **"Survivor: Earth" Lesson Plan Series**
- **Activity 1** Connecting the Spheres: Earth Systems
- **Activity 2** Earth's Water
- **Activity 3** The Water Cycle
- **Activity 4** Water in the Hydrosphere
- **Activity 5** Water in the Geosphere
- **Activity 6** Water in the biosphere
- **Activity 7** Water in the Atmosphere
- **Activity 8** Measuring Precipitation (Rain Gauge Included in Trunk)
- **Activity 9** Water Conservation
- **Activity 10** The Global Precipitation Measurement Mission (GPM)



IN REPLY REFER TO:

United States Department of the Interior

NATIONAL PARK SERVICE

Glacier National Park
West Glacier, Montana 59936

Dear Educator,

On behalf of Glacier National Park Education staff and USGS Repeat Photography Project scientists, as well as the Global Precipitation Measurement Mission, we thank you for checking out our Repeat Photography Trunk. Inside you will find the Repeat Photography Exhibit (the panels are numbered and should be set up in order) with tabletop easels or picture hangers for easy display in your school. We've also included two flash drives containing lessons and materials to share with your students. We hope the repeat photos will motivate you and your students to investigate more the role of water on our planet. Here are the key ideas that drove the creation of this trunk:

- We want to convey the obvious connection revealed by these photos of how much the glaciers here in Glacier National Park have melted, and their indication of a warming climate.
- We hope that the exhibit, used in connection with the Glacier National Park, Climate Change Teacher Resource Guide (on flash drive), will help teachers explore with students the importance of mountain snowpack and ice in providing fresh water around the world.
- Our goal is that students will care about changing precipitation patterns and the science behind GPM's mission to advance our understanding of Earth's water and energy cycles. They will realize that knowing these things can improve the forecasting of extreme events that cause natural disasters, and it could help extend current capabilities of using satellite precipitation information to directly benefit society. (GPM "Survivor: Earth" Lessons on flash drive.)

Please use the **'Repeat Photo Education Trunk' inventory** to make sure that the trunk contains everything listed. You can use this same sheet as a **return inventory** sheet to make sure that everything has been placed back into the trunk for its return to us. Sharing the trunk with other classrooms is encouraged. However, you, as the person who checks out the trunk, are responsible for its contents and returning it on time. Please report missing or broken items so that replacements can be arranged. Please fill in the evaluation (on the back of the inventory sheet). We will use your feedback to improve the Repeat Photography Trunk and to develop new trunks.

Sincerely,

Laura Law, Educational Specialist, Glacier National Park, 406-888-5837.

United States Geological Survey (USGS) Repeat Photography Project

You can find additional repeat photos and information at
<http://nrmisc.usgs.gov/repeatphoto/>

From the USGS website:

Climate change research in Glacier National Park, Montana entails many methods of documenting the landscape change, including the decline of the park's namesake glaciers. While less quantitative than other high-tech methods of recording glacial mass, depth, and rate of retreat, repeat photography has become a valuable tool for communicating effects of global warming. The evidence of worldwide glacial recession and the modeled predictions that all of the park's glaciers will melt by the year 2030, spurred USGS scientists to begin the task of documenting glacial decline through photography. The striking images created by pairing historic images with contemporary photos has given "global warming" a face and made "climate change" a relevant issue to viewers. The images are an effective visual means to help viewers understand that climate change contributes to the dynamic landscape changes so evident in Glacier National Park.

More information on USGS glacier studies:

- Repeat Photography - <http://nrmisc.usgs.gov/repeatphoto/>
- Climate Change in Mountain Ecosystems Program - <http://nrmisc.usgs.gov/research/global.htm>
- Glacier Retreat - http://www.nrmisc.usgs.gov/research/glacier_retreat.htm
- Glacier Research - http://www.nrmisc.usgs.gov/research/glacier_research.htm

More information on Climate Change in Glacier National Park:

- Climate Change Resource Guide for Glacier National Park - <http://www.gnpclimatechangeinfo.org/>
- GNP Climate Change brochure - http://www.crownsience.org/download_product/1316/0

Global Precipitation Measurement Mission NASA Survivor: Earth in 10 Lessons

Files are save on the flash drive included (please remember to “eject” the flash drive before removing it) and <http://pmm.nasa.gov/education/lesson-plans/survivor-earth>

These lessons are a result of the collaboration between Montgomery County Public Schools Outdoor Environmental Education Program and the Global Precipitation Measurement (GPM) Mission.

From the GPM Website:

The following lessons have been developed to teach students about local and global water issues. They are based on NASA’s Global Precipitation Measurement (GPM) Mission (<http://pmm.nasa.gov/gpm/>) and an instructional module designed for Montgomery County Public Schools Outdoor Environmental Education Program (<http://www.montgomeryschoolsmd.org/curriculum/outdoored/>).

The lessons connect with both the Next Generation Science Standards as well as the Common Core Curriculum and involve STEM topics. They are hands on activities that are done largely outdoors, and which include scientific data collection and analysis and integrate technology. Many of the lessons involve data collected based on protocols from the GLOBE Program (www.globe.gov). Each lesson is designed to take one hour. The lessons build on each other, but can also be used independently. Each lesson topic includes a lesson plan, PowerPoint presentation, student capture sheet and capture sheet answer guide.



Glacier Repeat Photo Trunk Inventory

Borrower:

Booking Period: _

The borrower is responsible for the safe use of the trunk and all its contents during the designated booking period. Replacement and/or repair for any lost items and/or damage (other than normal wear and tear) to the trunk and its contents while in the borrower's care will be charged to the borrower's school. If you have any questions please contact Laura Law at (406) 888-5837 or laura_law@nps.gov.

Please have an adult complete the trunk inventory checklist below, both when you receive the trunk and when you repack for return.

Item	Before	After	Condition
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Exhibit			
Measuring Glacial Change Panel			
Shepard Glacier Panel			
Thunderbird Glacier Panel			
Jackson Glacier Panel			
Grinnell Glacier Panel 1911-2008			
Grinnell Glacier Panel 1926-2008			
Boulder Glacier Panel			
Sperry Glacier Panel			
Art or Science? Panel			
Binder			
Trunk Instructions			
Activities			
USB Climate Change Resource Guide			
USB Global Precipitation GPM NASA			
Other			
Rain Gauge			
1000ml Beaker			
Spring Scale			
Please complete the trunk evaluation form (on reverse) and return it with the trunk.			



Glacier Repeat Photo Trunk Evaluation Form

Name: _____

School: _____

1. How did you use the materials?

- ☐ Large group/school-wide
- ☐ Classroom instruction
- ☐ Supplement to regular curriculum
- ☐ Other

2. How would you describe the audience?

- ☐ ___ Middle School
- ☐ ___ High School

3. Which trunk materials were most engaging? *(Check all that apply)*

- ☐ Repeat Photos
- ☐ Lessons/curriculum
- ☐ Field guide
- ☐ Other

4. How many students interacted with the trunk materials/curriculum? _____

5. How much instructional time did you use with the trunk contents? _____

6. In terms of the content/material in the trunk, what “worked” for you?

7. What did not work well for you and/or what suggestions do you have for improvement?

8. Do you have any suggestions for topics/themes for future trunks?

Discussion Points & Ideas for Using Repeat Photographs As Launch Pad for Engaging Viewers

- 1) Provide a “comment book” with an engaging question about the exhibit for viewers to respond to in writing.
- 2) Host a gallery showing and assemble a panel of local speakers to discuss other aspects of climate change as it affects the local/regional community (e.g. Climate experts from academia, city planners, artists, etc.).
- 3) Take repeat photos of you own community – find old photos in local libraries, courthouse, museum or personal collections and repeat the photo from the same location. See if there is evidence of climate related change?
- 4) Discover other ways to document the landscape and climate change.
What other mediums do artists use in merging science and art?
 - a. Example: Diane Burko is a painter that has used these repeat photos to document climate change in GNP as well as other icy parts of the world with her medium, paint.
<http://www.dianeburko.com/>
 - b. Consider what messages these photographs convey – today and for future viewers. Artists Trevor Paglen felt they conveyed a strong message and included a pair in his collection of one hundred photos called [The Last Pictures](#). These images were micro-etched on a gold plated disc and placed on a satellite to orbit the earth for billions of years.
- 5) Paint your own versions of glaciers “then and now” using the USGS images as reference.
- 6) Evaluate the photos as “art” vs “science.” What are the advantages and disadvantages of their usefulness for both audiences?
- 7) Explore other photographic means of documenting change on the planet with [NASA’s Images of Change](#).
- 8) Contribute useful observations and photos to climate scientists with [Alpine of the Americas Project](#).
- 9) Visit Glacier National Park and help us document landscape change with [repeat photography of glaciers](#).

Name: _____

Glacier Repeat Photos

<http://nrmsc.usgs.gov/repeatphoto/>

Station number	Glacier Name	Dates or range of photos	Describe the scenery in one sentence	Explain how the scenery has changed over time
1				
2				
3				

Complete the following chart using the 6 stations that you visit.

Stations 4 to 7 on the back

Station number	Glacier Name	Dates or range of photos	Describe the scenery in one sentence	Explain how the scenery has changed over time
4				
5				
6				

Name: _____

Repeat photos

Part 1: Glacier National Park

1. Go to the following website <http://www.nrmsc.usgs.gov/repeatphoto>
2. From the background information, what are three signs of the climate at Glacier National Park changing?
3. In the overview section read what the purpose of the project was and how it took place. Give a 3 to 4 sentence summary in your own words.
4. Look on the main page, what are the two government agencies responsible for this project?
5. Click on the information sheet on the right side of the screen. From this sheet answer the following questions/ statements in your own words:
 - a. In two or three sentences explain what qualifies as a glacier.
 - b. In two or three sentences explain the main cause(s) for their melting.
 - c. What are two effects of losing the glaciers?
 - d. Scroll down to the data page. What is the difference between the two columns in blue?
 - e. On the data page, what is the general trend for percent coverage? Include numbers in your answer.
6. From the main page select any three glaciers from the left side of the screen. For each give the name, dates of the photos and a one sentence explanation of what changes you observe.

Part 2: (Your Hometown) Repeat Photo Assignment

1. Using your own knowledge of (your hometown), Google Earth or historical data about (your hometown) state five changes in land use over the last 10 years that are observable.

2. For your list, which do you think could impact our climate or biome the most? Why?

3. Select two photos of (your hometown) that are at least 10 years apart. They must reflect some type of change over time that is measurable and had an impact on our biome or climate.
 - a. In a 4 to 6 sentence paragraph explain what change has taken place and its impact.

 - b. Title the pictures with the location and dates

 - c. Attach your photos to this paper or write email on this page if you plan on emailing them to me.